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ABSTRACT

These summaries have been compiled to assist users in selecting terminals for use with the National Library of Medicine (NLM) on-line systems. The summaries describe the salient characteristics and approximate prices of a large number of hard copy and display devices. Many of the terminals listed may be modified by the addition of various options such as upper and lower case, printed interface, and magnetic tape cassette units. Prices quoted are basic costs, not including options. Preceding the descriptive information are four sections: factors to be kept in mind when selecting a terminal, definitions of terms used in this article, a schematic of various terminal interfaces to communication facilities, and the address of each supplier. (Author)

ED 096940

ON-LINE COMMUNICATIONS DEVICES

By
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Office of Computer and Communications Systems

The attached summaries have been compiled to assist users in selecting terminals for use with the NLM on-line systems. The summaries describe the salient characteristics and approximate prices of a large number of hard copy and display devices. Many of the terminals listed may be modified by the addition of various options such as upper and lower case, printer interface, magnetic tape cassette units, etc. Prices quoted are basic costs (options not included). Preceding the descriptive information are three sections containing definitions of terms used in this article (Attachment 1), a schematic of various terminal interfaces to communication facilities (Attachment 2), and the address of each supplier (Attachment 3).

The following factors should be kept in mind when selecting a terminal:

1. On-line Access

The NLM on-line systems operate on the NLM computer system in Bethesda, Maryland and at the State University of New York (SUNY) in Albany, New York. The NLM system can be accessed through the Direct Distance Dialing (DDD) Network, the TYMSHARE Network (TYMNET), The Department of Defense Advanced Research Projects Agency's Network (ARPANET), the Federal Telephone System (FTS), and the Teletypewriter Exchange (TWX) Service. The SUNY system can be accessed only through the DDD and TYMNET.

Input terminal requirements are determined by the mode of access. Specifics relating to each are shown below.

Type of Access	Type of Terminals	Speed*	Transmission Mode	Code**	Special Features Required
DDD and FTS	Teletype 33/35 Compatible	10,30 120 cps	Half-duplex	ASCII	Even parity
	IBM 2741 Compatible	15 cps	Half-duplex	EBCDIC/ Correspondence	Receive and transmit Interrupts
	IBM 3270 Compatible	120 cps	Half-duplex	EBCDIC	
TWX	Teletype 33/35	10 cps	Half-duplex	ASCII	

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Type of Access	Type of Terminals	Speed*	Transmission Mode	Code**	Special Features Required
ARPANET	Teletype 33/35 Compatible	10,30 cps	Full and Half-duplex	Full ASCII	
	Teletype 37 Compatible	15 cps			
	IBM 2741 Compatible	15 cps		EBCDIC	
TYMNET	Teletype 33/35 Compatible	10,30 cps	Half and Full duplex	Full ASCII	
	Teletype 37 Compatible	15 cps		Full ASCII	
	IBM 2741 Compatible	15 cps		EBCDIC/ Correspondence	Receive and transmit Interrupts

* Only asynchronous transmission is supported

** NLM plans to support Full ASCII in the near future

Care must be taken for IBM 2741 compatible devices if access is via TYMNET since the NLM and SUNY interfaces to the network do not permit both EBCDIC and correspondence codes to be accepted at each access point. Users considering acquiring this type of terminal should check with MEDLARS Management Section (301) 496-6193 prior to the placing of a purchase order.

With the exception of the ARPANET, users can send interrupts to the computer system to stop the computer transmission to the terminal by depressing the break key on a teletype compatible terminal or the attention key (for a transmit interrupt) on an IBM 2741 compatible terminal. The receive interrupt feature is required on the latter device in order for the computer to interrupt the terminal to send messages. ARPANET users are required to send unique characters defined to the computer system plus carriage return in order to accomplish the equivalent of a transmit interrupt.

2. Terminal Interface to the Communication Line

Terminals transmit data over the telephone lines either via a telephone handset in an acoustic coupler or a data/set modem connected directly to the telephone lines (see Attachment 2 for a schematic of different interfaces). An acoustic coupler translates the language of the terminal into touch-tone signals for analog transmission or in the reverse for terminal receipt of data. If the line quality is not good, couplers cannot filter out the noise as well as data sets/modems. Acoustic couplers are generally less expensive than modems/data sets and have the advantage of providing terminal portability (since couplers vary in quality,

it is recommended that Ms. Barbara Sternick, Data Communications (301) 496-1351 be contacted before making this selection). Many terminal suppliers provide options for a built-in coupler, modem, and/or a standard RS 232C interface for connecting to a modem/data set or external coupler. To attach a modem not provided by the Telephone Company it is necessary to obtain a data access arrangement before a connection can be made to the telephone network. Couplers, data sets or modems must be Bell System compatible 103A or 113A for speeds up to 300 bits per second (bps) (i.e., 10 to 30 cps) or Bell compatible 202C or 202S with reverse channel for speeds of 1200 (120 cps).

3. Compatibility

Suppliers have made a great effort to provide terminal compatibility with major terminal suppliers (Teletype Corporation and IBM), but with various enhancements in capability, idiosyncracies exist. A terminal is generally identified as Teletype 33/35 Compatible, IBM 2741 Compatible, or IBM 3270 Compatible. Before buying or leasing a terminal, it is advised that you try it on the NLM on-line systems to make sure it works properly, is easy to use, and meets your requirements.

4. Transmission Speeds

Most teletype compatible terminals operate at 10 to 30 cps, although some teletype compatible cathode ray tubes (CRT) terminals operate at higher speeds. Speeds can be an important factor since lower speeds increase costs for connect time. Even though the mode of access may not permit higher terminal speeds at this time, it may be desirable to procure terminals with variable speed settings, including the 120 cps rate, in order to have the capability when it becomes available (TYMNET plans to provide 120 cps within the next year). Variable speed settings also permit speed reduction when line quality deteriorates.

5. Type of Terminal

In general, teletypewriter terminals are non-buffered; i.e., as a character is typed, it is sent over the transmission line. Most CRT devices have buffers or memories for transmitting and receiving entire messages from the terminal. Buffering or memory capacity at the terminal permits editing in the buffer before transmission, printing on demand, and an ability to recall several pages of input and/or output. A tape cassette unit attached to teletypewriters or CRTs can also provide the capability to store one or more messages. Factors to be considered when selecting terminals are portability, noise level, hard copy requirements, system compatibility, availability of maintenance, reliability, and cost. If the terminal is stationary and noise is a factor, a relatively inexpensive CRT (soft copy) device should be considered. If a hard copy or permanent record of the transaction is required, a receive only relatively quiet thermal printer can be attached

to most CRTs (adding a hard copy interface could increase the cost of the CRT). Hard copy keyboard send/receive (KSR) or automatic send/receive (ASR) terminal are rapidly decreasing in cost and are gradually being upgraded to speeds greater than 30 cps. ASR terminals are treated as KSR devices by the NLM systems since there is no capability for the computer system to automatically dial the terminal. It should be noted that terminals with intelligence built in provide a great potential for capability and flexibility. They can easily be programmed to interface with systems with differing requirements as well as perform pre-processing of input.

6. Cost

Most suppliers have both purchase and lease plans. On some lease plans, a percentage of the monthly rates is applied toward the purchase price. It might be wise to consider the growth potential of the device(s) before deciding to purchase as well as the lease versus purchase break-even point. Maintenance is generally included in the lease prices but is a separately procured service from the supplier upon purchase.

DEFINITION OF TERMS USED

ASCII -- An eight-level code (8 bits) adopted by the American Standards Association to achieve compatibility between devices.

ASYNCHRONOUS TRANSMISSION - Transmission in which each character is synchronized by start and stop bits. These 2 bits are added to each character transmitted.

CHARACTER -- A bit configuration representing one character.

DATA ACCESS ARRANGEMENT -- An interface for a non-Bell modem to the telephone system approved by the Federal Communications Commission (FCC) to insure the integrity of the communications facilities.

DATA SET/ MODEM -- A device which provides the modulation/demodulation and control functions necessary for the terminal or computer to transmit data across the communications lines.

DIRECT DISTANCE DIALING -- A telephone service which enables a user to call other subscribers without operator assistance.

DUPLEX (FD) (FULL-DUPLEX) TRANSMISSION -- Information can be transmitted and received simultaneously. With the use of full duplex transmission, characters typed are echoed back to the terminal from the point called if the computer system can handle FD (users can determine if the character typed has been received properly at the point of access to the network).

HALF-DUPLEX (HD) -- A circuit designed for transmission in either direction but not at the same time. In this mode, characters cannot be echoed back.

PARITY -- The addition of a bit to a character to make it even or odd. This permits detection of single errors in a character.

RS 232 INTERFACE -- The Electronic Industries Association's standard which defines the interface between the modem and data processing equipment.

TTY COMPATIBLE - Means that the terminal transmits the basic TTY ASCII character set (approximately 64 characters - upper case only). Some terminals can transmit the basic ASCII as well as full ASCII (64 characters plus approximately 32 additional characters -- lower case characters included).

SCHEMATICS OF TYPES OF

COMMUNICATIONS INTERFACES

Attachment 2

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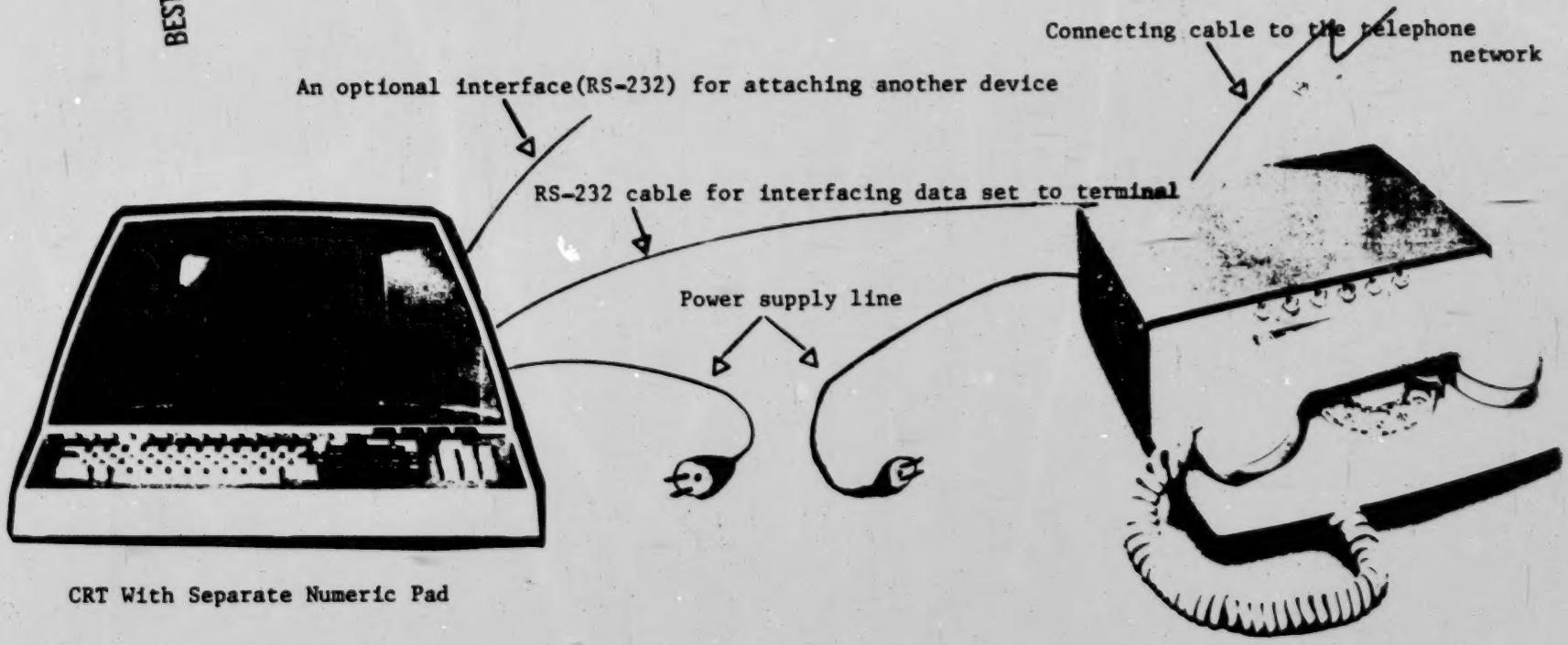
A Terminal being connected to a distant computer over the switched network via a Data Set

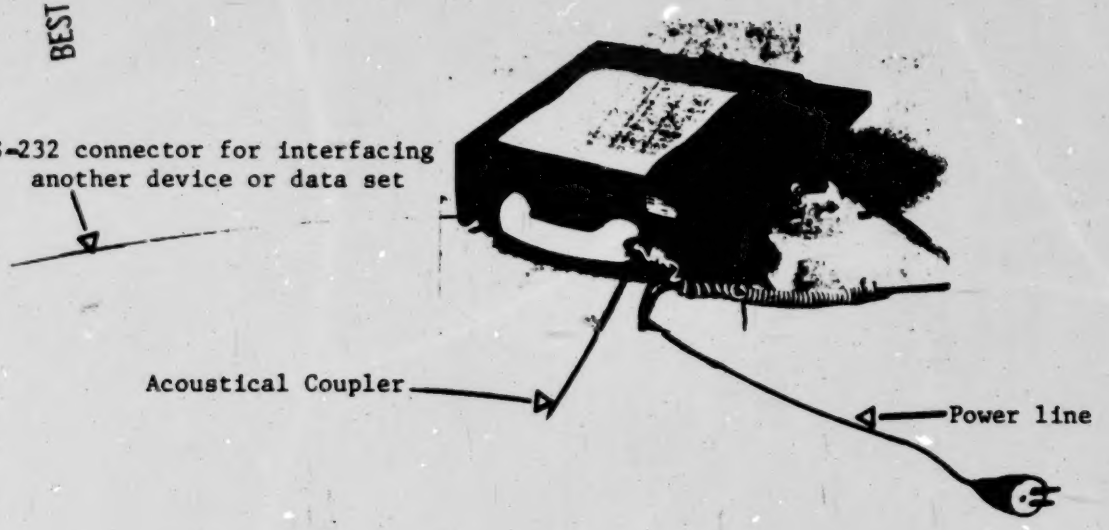

Connecting cable to the telephone network
An optional interface(RS-232) for attaching another device
RS-232 cable for interfacing data set to terminal
Power supply line

CRT With Separate Numeric Pad

AT&T Dataphone Service(DDD)

BEST COPY AVAILABLE

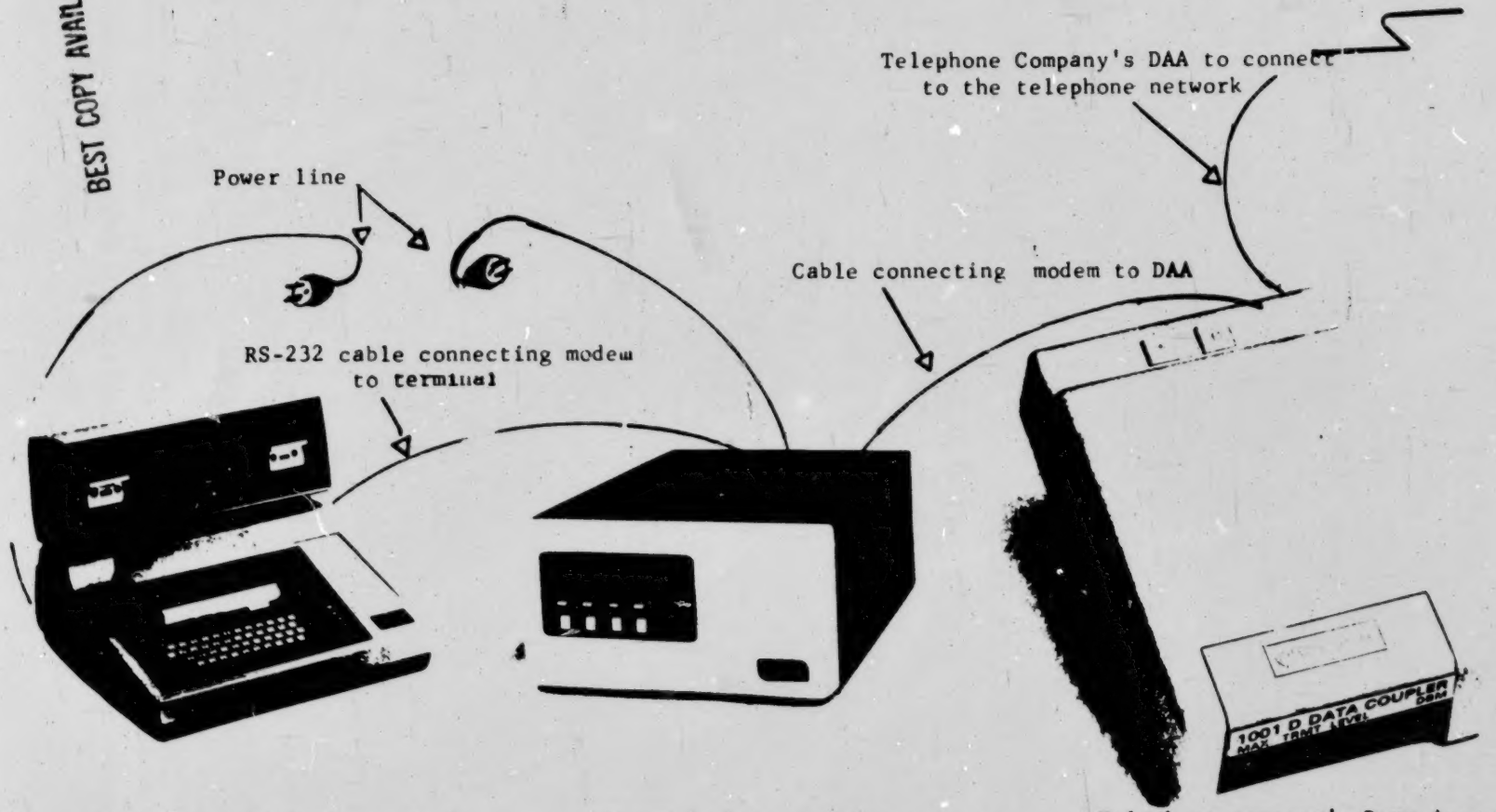
A terminal being connected to a distant computer via a normal telephone handset placed in an acoustical coupler



Terminal with a built-in acoustical coupler

A terminal connected to a distant computer via a non-telephone company modem and Data Access Arrangement(DAA)

BEST COPY AVAILABLE


Telephone Company's DAA to connect to the telephone network
Power line
Cable connecting modem to DAA
RS-232 cable connecting modem to terminal
1001 D DATA COUPLER

Terminal with single or dual magnetic tape cassette(s)

Non-Telephone company modem

Telephone company's Data Access Arrangement(DAA)

SUPPLIER's ADDRESSES

SUPPLIER

Anderson-Jacobsen, Inc.
1065 Morse Avenue
Sunnyvale, California 94086
(408) 734-4030

Ann Arbor Terminals, Inc.
6107 Jackson Road
Ann Arbor, Michigan 48103
(313) 769-0926

Applied Digital Data Systems, Inc.
Hauppauge, New York 11787
(516) 231-5400

Beehive Terminals
Beehive Medical Electronics, Inc.
1473 South 6th Street
Salt Lake City, Utah 84104
(801) 487-0741

The Bendix Corporation
Interactive Terminals Corporation Division
32969 Hamilton Court
Farmington, Michigan 48024
(393) 477-3700

Centronics Data Computer Corporation
Hudson, New Hampshire 03051
(603) 883-0111

Computer Devices, Inc.
Burlington, Massachusetts 01803
(617) 273-1550

SUPPLIER

Computer Optics, Inc.
Berkshire Industrial Park
Bethel, Connecticut 06801
(203) 744-6720

Computer Transceiver Systems, Inc.
Paramus, New Jersey 07652
(201) 261-6800

CONRAC Corporation
600 North Rimsdale Avenue
Covina, California 91722
(213) 966-3511

DASYN
2800 "F" South Main Street
Santa Ana, California 92707
(714) 557-2843

Datapoint Corporation
9725 Datapoint Drive
San Antonio, Texas 78284
(512) 696-4520

Data Interface, Incorporated
4 West Kenosia Avenue
Danbury, Connecticut 06810
(203) 792-0290

Data Products
Telecommunications Division
17 Amelia Place
Stamford, Connecticut 06902
(302) 325-4161

Data Terminals and Communications
Post Office Box 5583
San Jose, California 95150
(408) 378-1112

SUPPLIER

DELTA DATA SYSTEMS CORPORATION
Woodhaven Industrial Park
Cornwell Heights, Pennsylvania 19020
(215) 639-9400

DIGI-LOG
Digilog Systems, Inc.
Babylon Road
Horsham, Pennsylvania
(215) 672-0800

DI/AN Controls Incorporated
Boston, Massachusetts 02125
(617) 288-7700

Digital Equipment Corporation
Maynard Massachusetts 01754
(617) 897-5111

General Electric Communications Systems
Waynesboro, Virginia 22980
(703) 942-8161

Hazeltine Corporation
Greenlawn, New York 11740
(516) 261-7000

Incoterm Corporation
6 Strathmore Road
Natick, Massachusetts 01760
(617) 655-6100

INFOTON
Subsidiary of Optical Scanning Corporation
Second Avenue
Burlington, Massachusetts 01803
(617) 272-6660

SUPPLIER

INTERNATIONAL BUSINESS MACHINES
(IBM) Corporation
1133 Westchester Avenue
White Plains, New York

Lear Siegler, Inc.
Electronic Instrumentation Division
714 North Brookhurst Street
Anaheim, California 92803
(714) Prospect 4-1010

Memorex Corporation
San Tomas at Central Expressway
Santa Clara, California 95052
(408) 978-1000

National Cash Register
Dayton, Ohio 45409
(513) 449-3509

OMRON Systems, Incorporated
432 Toyama Drive
Sunnyvale, California

ONTEL Corporation
3 Fairchild Court
Plainview, New York 11803
(516) 822-7800

Printer Technology, Inc.
Sixth Road
Woburn Industrial Park
Woburn, Massachusetts 01801
(617) 935-4246

Raytheon Data Systems
1415 Boston-Providence Turnpike
Norwood, Massachusetts 02062
(617) 762-6700

SUPPLIER

Sanders Data Systems, Incorporated
Daniel Webster Highway, South
Nashua, New Hampshire 03060

Scientific Measurement Systems, Incorporated
26 Olney Avenue
Cherry Hill, New Jersey 08003
(609) 424-5220

Sperry Rand Corporation
Univac Division
322 North 22nd West
Salt Lake City, Utah 84116
(801) 328-8066

Stelma, Incorporated
17 Amelia Place
Stamford, Connecticut 06904

Sycor, Incorporated
100 Phoenix Drive
Ann Arbor, Michigan 48104
(313) 971-0900

Tally Corporation
830 South, 180th Street
Kent, Washington 98031
(206) 251-5500

TEC, Incorporated
9800 North Oracle Road
Tucson, Arizona 85704
(602) 297-1111

Teletype Corporation
Skokie, Illinois 60076
(312) 982-2000

SUPPLIER

Tektronic, Incorporated
P. O. Box 500
Beaverton, Oregon 97005
(503) 644-0161

Terminal Communications
330 Terminal Drive
Raleigh, North Carolina 27611
(919) 834-5251

Texas Instrument, Incorporated
Houston, Texas 77001
(713) 494-5115

Tycom Systems Corporation
26 Just Road
Fairfield, New Jersey 07006
(201) 227-4141

Western Union
18 McKee Drive
Mahwah, New Jersey 07430
(201) 529-1170

Westinghouse Canada Limited
Electronic Systems Division
Box 510
Hamilton, Ontario, Canada
(416) 528-8811

The devices listed in Attachments 4 and 5 are not to be construed as lists of recommended devices. They do, however, represent some of the devices investigated having characteristics compatible with the NLM on-line systems.

DISPLAY DEVICES

Attachment 4

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Ann Arbor Terminals	Design III K2480D	Type - Teletype Compatible Transmission Speeds - 110 to 9600 bps (selectable) Full/Half Duplex Character Set - ASCII Communications Interface - separate modem or acoustic coupler must be acquired Screen size - 14 inches containing: 24 lines by 80 characters each Weight - 49 lbs. (including keyboard) Options: Upper case and lower case, specific transmission speed(s), and parity May attach a video monitor or a hard copy device		$1920
Applied Digital Data Systems, Incorporated	Consul 840 and 880	Type - Teletype Compatible Transmission speeds - 110 to 2400 bps, 30 bps if built-in coupler is used Full/Half Duplex Character set - ASCII Communications Interface - May have as an option a built-in acoustic or a separate modem or acoustic coupler may be acquired Screen Size - 12 inches containing: 16 lines by 64 characters per line (model 840) or 24 lines by 80 characters per line (model 880) Weight - 52 lbs. Options: Hard copy interface ($150); built-in modem ($250); Cassette Recorder		$2544 (840) $2870 (880)

DISPLAY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Applied Digital Data Systems, Incorporated	Envoy 640 or 680	Type - Teletype Compatible Transmission speeds - 110 or 300 bps Half-Duplex only Character Set - ASCII Communications Interface - Built-in acoustic coupler Screen size - 5 inches containing: 16 lines by 64 characters/line (model 640) or 24 lines by 80 characters/line (model 680) Weight - 28 lbs. Video output is a standard interface option for attaching a TV monitor. The company sells a monitor for $350.		$3260 (640) $3740 (680)
Beehive Terminals	Super Bee	Type - A micro-programmable device providing the capability to communicate using most codes Transmission speeds - up to 9600 bps (switchable) Full/Half Duplex Character Set - Programmable for full ASCII Communications Interface - Must acquire a separate acoustic coupler or modem Screen size: 12 inches rectangular containing: 25 lines by 80 characters each An interface is standard for attaching a printer Weight - 65 lbs. (including keyboard) Scroll mode - upward Formatting capability Options: Editing functions; special function keys The supplier also produces a Mini Bee which is upper case only and does not include	$115/mo.	$3295

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
		some of the other Super Bee features such as editing. The price for the MINI BEE is $1795 NOTE: Third party leasing arrangements exist		
The Bendix Corporation	3001	Type - Teletype Compatible Transmission speeds - 110 to 4800 bps Full/Half Duplex Character Set - ASCII Communications Interface - separate modem or acoustic coupler must be acquired Screen size - 15 inches containing: 16 lines by 80 characters each Weight - 80 lbs. Roll or page mode Switch selectable parity Options: formatting capability; upper case and lower case; printer and cassette interfaces	None	$2300
Computer Optics	CO:77	Type - IBM 3270 Compatible This is a display system which could contain up to 32 devices (displays and printers) attached to a controller or a stand-alone system. The controller may be remote to the computer facility or local. There is no leased telephone line or modem with the local system. The stand-alone display system may be used via the DDD network Transmission Speeds - Display - Remote - 1200 bps to 2400 bps Local - speed of computer I/O channel Printer - 100 cps	$244/mo $280/mo $45/mo $15-20/mo $162- $175/mo	Control Unit Remote $6,111 Local $7,011 Display $1,131 plus $450-600 for keyboards Printers $4860-5260

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
		Character set - Remote - ASCII or EBCDIC Local - EBCDIC Communication Interface - Remote controller or stand-alone system connects to an appropriate modem/data set. Screen size - 15 inches containing: 480, 960 or 1920 characters Printer line capacity - 132 characters Printer type - matrix impact Options: High-speed transmission - 4800 bps, 7200 bps, or 9600 bps; Device adapters (up to 4) each provides for up to 8 displays and/or printers $940 each	$150/mo	Stand-alone Display $3750
CONRAC	480 TTY Plus	Type - Teletype compatible Transmission speed - 110 to 9600 bps Full Duplex Character set - ASCII Communications Interface - Requires a separate acoustic coupler or modem Screen size - viewable area 6 inches by 3 inches high-contains 80 characters by 6 lines Options: Printer interface; 8 lines by 80 characters each; Scroll up/down; editing features		$1200

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
DASYN	106	Type - Teletype compatible Transmission speed - 1200 bps Half Duplex Character set - ASCII Communications Interface - Requires an acoustic coupler or a modem Optional Parity - must be specified prior to delivery Printer Interface Screen size - 9 inches diagonal User may have 4 active pages or 256 characters per page Basic system covers 7 thousand characters of storage		$6000
DATAPOINT	3300	Type - Teletype Compatible Transmission speed - 110 to 2400 bps Full/Half Duplex Character set - ASCII Communications Interface - Separate acoustic coupler or modem must be acquired Screen size - 12 inch rectangular tube containing: 25 lines of 72 characters each Weight - 48 lbs. Controls exist for roll up or down Options: 10 key numerical entry; magnetic tape memory unit containing up to 200 frames (25 lines of 72 characters each). NOTE: 1) Datapoint produces a thermal printer with a data rate up to 30 cps which can be attached to the CRT 2) Datapoint produces several additional terminals, including the intelligent 2200 and 1100	$95/mo	$3240.00

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Delta Data Systems Corporations	5100	Type - Teletype compatible Transmission speeds - 110 to 600 bps Full/Half Duplex Character set - ASCII Communications interface - requires an acoustic coupler or a modem Screen size - 14 inches diagonal containing: 27 lines of 80 characters each Scroll up/down Weight - 80 lbs. Options: Upper case and lower case; block transfer vice character by character; transmission speeds up to 9600 bps; 2000 additional character memory; printer interface NOTE: This display permits up to 3000 characters (blanks excluded) to be retained in its memory for editing, browsing, etc. Several different models are available	$145.00	$3,070 (extra installation charge)
Digital Equipment Corporation	VT05	Type - Teletype Compatible Transmission speeds - 110, 150, 300, 600, 1200, and 2400 bps Full/Half Duplex Character set - Full ASCII Communications interface - Must acquire a separate coupler or modem Screen size - 20 lines of 72 characters each This device will accept video input for a TV camera for simultaneous display of video image and data from the computer or interface to specific hardcopy devices. A new low cost CRT (VT50) is now available for less than $1,000		$2795 +$50 - $75 for modem cable

DISPLAY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Hazeltine	2000	Type - Teletype compatible Transmission speeds - 110, 300, 1200, 2400, 9600 bps Full/Half Duplex Character set - ASCII Communications interface - Must have a separate acoustic coupler or modem Screen size - 12 inch diagonal containing: 27 lines of 74 characters each Weight - with keyboard, 62 to 63 lbs. Switchable parity settings and editing capabilities This device provides interfaces for a magnetic tape cassette, printer, and remote printers Options: Variations in transmission speeds Upper case/Lower case ($150)	$88/mo	$2995 $20/mo maintenance $2400 for U.S. Government
INCOTERM	SPD Message Master 10/20	Type - This is a two-unit configuration comprised of an intelligent (programmable) display device and a printer. It can be programmed to interface with Teletype compatible devices as well as the IBM 3270 Display System. The supplier provides software for the standard devices Transmission speeds - up to 9600 bps Full/Half Duplex Communications Interface: Separate modem or acoustic coupler must be acquired Screen size - 9.5 inches high by 7 inches wide containing up to 30 lines by 64 characters each Options: May obtain a 100 cps printer in lieu of the standard 15 cps	$232/mo (maintenance extra) $47/mo	$7200 maintenance $47/mo

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Infoton Incorporated	VISTAR/XL (Delivery January 1975)	Type - Micro programmable with two modes of operation - buffered/unbuffered Transmission speeds - up to 9600 bps (selectable) Full/Half Duplex (unbuffered mode only) Character set - ASCII Communications interface - separate coupler or modem required Screen size - 9 inches by 7 inches containing 24 lines of 80 characters each Standard Features: Roll or page mode, format mode, transmit modes, and parity options Options: Upper case/lower case, extended memory (up to 3 full pages), special function keys, and printer interface		
International Business Machines	3270 System	Type - The 3270 Information System consists of Display devices and printers. It can be a stand-alone unit or a cluster of devices (up to 32). The System can be remotely located from the computer complex or at the computer site. The clustered system requires a separate controller. Transmission speeds - 1200, 2000, 2400 and 4800 bps Half Duplex Character set - ASCII or EBCDIC Communications interface: separate modems (the clustered system requires 1 modem for the lease line to the computer site.) Screen size - Model 1 - 480 characters (12 x 40) Model 2 - 1920 characters (24 x 80) * stand-alone unit	Controller Model 1 - $165/mo Model 2 $180/mo $75-$120/mo $110-145/mo	Controller Model 1 - $6500 Model 2 - $7200 $3400-$5500* $4400-6500*

DISPLAY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
		Printer - Model 1 - 40 cps Model 2 - 66 cps Model 3 - 40 cps (for the stand-alone unit) Editing capability Options: Light Pen, extended character set, variable keyboards The printer is a matrix printer and is relatively quiet.	 $150/mo $160/mo $130/mo	 $5850 $6560 $5590
Lear Siegler, Inc.	LSI 7700A	Type - Teletype compatible Transmission speeds - 110, 300, 1200, 1800, 2400, 4800, 9600 bps Full/Half Duplex Character Set - ASCII (will accept lower case) Communications Interface - must acquire a separate modem or acoustic coupler Screen size - 12 inch diagonal containing 25 lines of 80 characters each Weight - 60 lbs. Roll (scroll) modes Printer and/or cassette interfaces options Editing capability Split screen Screen Protect - partial or all for formatted input	$88/mo	$?895
Lear Siegler, Inc.	ADM-1 and ADM-2	Type - Teletype compatible Transmission speeds - 110, 300, 600, 1200, 1800, 2400, 4800 and 9600 bps Full/Half Duplex Character set - ASCII (will accept lower case); ADM-2 has full ASCII Communications Interface - must acquire a separate modem or acoustic coupler		$1525 (ADM-1) $2595 (ADM-2)

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
		Screen size - 12 inches containing: 12 lines by 80 characters each; ADM-2, 24 lines by 80 Weight - 45 lbs. Protected field(s) capability Options: 24 lines by 80 character screen; editing; keyboard extension		
OMCRON	8024A	Type - Teletype compatible Transmission speeds - 110 to 9600 bps Full/Half Duplex Character set - Full ASCII Communications Interface - must acquire a separate acoustic coupler or modem Screen size - 15 inches diagonal containing: 24 lines by 80 characters each Options: Expandable character set; roll/scroll; printer interface; expandable memory; editing features; function keys This device comes with a 2048 character memory which is expandable up to 16,384 characters and is a programmed device.		$2450
ONTEL	4300	Type - Teletype compatible Transmission speeds - 110 to 9600 bps Full/Half duplex Character set - Full ASCII Communications Interface - must acquire a separate acoustic coupler or modem Screen size - 14 inch diagonal containing: 20 lines by 80 characters each Parity options, scrolling, and editing Options - Upper case only (model 4200); multi-page memory (up to 12,800 characters); printer and cassette interfaces (up to 300 bps)		$3395 (maintenance and installation extra)

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
		NOTE: This is an intelligent terminal (programmable) which has a basic storage of 1600 characters expandable to 6400.		
Raytheon	PTS 100	Type - This mini-computer system is a programmable communication system which can simulate various types of terminals - IBM 3270 Display System, teletype compatible, etc. Transmission speeds - up to 9600 bps Full/Half Duplex Screen capacity - 480, 960, 1920 characters Upper and lower case plus special symbols	$180/mo (Mini-configuration)	$6250
Sanders	8170	This system is similar to the IBM 3270 Remote Display System. It has additional capabilities since it is programmable. Varied printer speeds can be attached to the system. (The highest speed is 200 lines per minute). Character set - EBCDIC (upper and lower case with typewriter style keyboard) * includes a 12 thousand byte processor	$380/mo $405/mo	*Controller (plus) (2) Displays $15,200 Maintenance $62/mo Printer - $9675
Sanders	804	Type - Teletype compatible or IBM 3270 Display System (stand-alone) Transmission speed - up to 9600 bps Full/Half duplex Character set - Full ASCII or EBCDIC Communications Interface - Must acquire a separate acoustic coupler or modem Screen size - 11 inches containing 24 lines of 80 characters each. This is an intelligent terminal which has a 4 thousand character memory for teletype compatible terminals.	$200/mo	$5630 (Processor) maintenance $29/mo Screen ($1100)

DISPLAY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
		The full ASCII keyboard can be purchased for $425.00 ($5 maintenance) or leased for $15/mo. An I/O interface for the DDD Network leases for $25/mo or purchased for $700.		
Scientific Measurements Systems, Inc.	1440	Type - Teletype compatible Transmission speed - 110, 150, 300, 600, 1200 bps (switch selectable) Even parity standard feature Character set - Full ASCII (lower case displayed as upper) Communications Interface - must acquire a separate acoustic coupler or modem Screen size - 12 inches containing 18 lines of 80 characters each Weight - 52 lbs. Scroll (roll) or page mode Video output - generates video signal compatible with most closed circuit TV systems Printer interface connector Formatting Options: Extended editing capability, lower case displayed ($400)	$115/mo	$1995
SYCOR	255-2 or 257-2 (clustered)	This terminal system is compatible with the IBM 3270 Display System. Additional capabilities exist in that the 255 is an intelligent terminal (up to 6 thousands characters of memory). Transmission speeds - 1200 bps to 4800 bps Character set - EBCDIC Communications Interface - separate modem must be acquired Screen size - 9 1/2 x 6 1/2 inches containing 24 lines of 80 characters each	$110/mo $96/mo	$4,840 $4,220

DISPLAY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
		Weight - 85 lbs Options - Full ASCII transmission, printer (40, 80 or 165 cps) NOTE : The clustered display devices require a Remote Control Unit ($3,790) 1) Maintenance extra 2) Smaller screens are available		
TEC Incorporated	455	Type - Teletype compatible Transmission speeds - 110 to 9600 bps (switchable) Full/Half Duplex Character Set - ASCII Communications Interface - Must acquire a separate acoustic coupler or modem Screen Size - 12 inch diagonal containing 24 lines of 80 characters each. Options: Printer interface Other Features: 2048 character memory Message editing features NOTE: The manufacturer produces other display devices - some at a lower cost.		$2390
TEKTRONIX	4023	Type- Teletype compatible Transmission speed - 110 to 9600 bps (switchable) Full/Half Duplex Character set - Full ASCII Communications Interface - Requires a separate acoustic coupler or modem Screen Size - 12 inch diagonal containing 24 lines of 80 characters each Weight - 34 lbs. Formatting and editing controls Permits printer and cassette interfacing	$125/mo	$2995

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Teletype Corporation	40	Type - Teletype compatible Transmission speed - 1200 bps Half Duplex Character set - Full ASCII Screen size - 24 lines of 80 characters each This model 40 is a complete station arrangement for message preparation, editing, and on-line interactions. It can be a single keyboard display unit or a Receive only printer, cassette or a combination. Options include: Scrolling memory options of 3 pages of 1920 characters each, printed form option and formatting. This system is leased from the local telephone company.	Printer & Display approximately $250/mo	$4585 - $5610
Terminal Communications Incorporated	TC-275	Type - Compatible with the IBM 3270 Display System's stand-alone Display and Model 3 printer (other terminal compatibilities may be special ordered). Transmission speed - Up to 4800 bps on a private line or 1200 bps on the DDD Network Character set - ASCII or EBCDIC Communications Interface - A separate acoustic coupler or modem must be acquired Screen size - 14 inches containing either: 12 lines of 40 characters each or 24 lines of 80 characters each. Weight - 90 lbs. approximately Edit and format capabilities Optional features - Display printer (30 cps) TC-234, Light pen, ASCII or EBCDIC type of keyboard.	$125/mo $120/mo	(Display) $4625 (Printer) $3950

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Texas Instrument	912	Type - Teletype compatible Transmission speed - switch selectable to 9600 bps Full Duplex Character set - ASCII Communications Interface - The user may acquire a built-in modem or acquire a separate acoustic coupler or modem. Screen size - 12 inch diagonal containing 24 lines of 80 characters each. Printer interface available - Printing (at 110 or 300 bps) controlled by separate print key on keyboard. Options: built-in modem		$2100
Westinghouse	1600	Type - Teletype compatible Transmission speeds - 110 to 9600 bps Full/Half Duplex Character set - ASCII Communications Interface - Must acquire a separate modem or acoustic coupler Screen size - 7 x 9 inch containing 20 lines of 80 characters each. Printer interface available (speeds up to 1800 bps) Roll or page mode - Field strappable Editing and format features Options: Multi-drop addressing, upper case/ lower case ($300)		$2850

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Anderson-Jacobson	841	Type - IBM 2741 Compatible Transmission Speed - 134.5 bps (15 cps) Characters/line - 130 or 156 Communications Interface - Built-in modem or can be plugged into a separately acquired acoustic coupler or modem Weight - 54 lbs. Character set-Correspondence or EBCDIC Impact Printer	$118/mo (minimum 3 month lease)	$4575 $65 Shipping and installation
	AJ631	Type - Teletype Compatible Transmission speeds - 10, 15, and 30 cps Full/Half duplex operation Parity - even with provisions to modify Character set - upper case and lower case Communications Interface - User may obtain an acoustic coupler or obtain optional built-in modem Weight - 37 lbs. Print Head - Dot Matrix Thermal Carriage - 140 characters/line May be attached to a display unit	$165/mo	$4245
Centronics	308	Type - Teletype Compatible Transmission speeds - 1200 bps Characters/line - 80 Impact printer - up to 5 copies may be printed Modem - none (user must obtain an acoustic coupler, modem or data set Upper case expandable to lower case (lower case prints as upper case) Weight - 90 lbs. May be attached to a display unit as a receive only printer (model 306) Communications Interface extra (Centronics also manufactures other devices; e.g., wide carriage, printer only, and higher speeds).		$2690

HARDCOPY AND KEYBOARD ONLY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
COMDATA Corporation	33	Type - Teletypes (ASR and KSR) Transmission speed - 110 bps Character set - ASCII Characters per line - 80 Options: Combination Teletype and TWX; Automatic-send-and receive, (ASR); Keyboard send-and receive; (The supplier provides other terminals, acoustic couplers, and modems)	$30 - $53/mo	$817 - $1535
Computer Devices	930	Type - Teletype Compatible Transmission speed - 110, 150, 300 bps Parity options Full/Half duplex Character set - Full ASCII Communications Interface - Requires a separate acoustic coupler or modem Characters/line - 80 Weight - 22 lbs. Thermal printing mechanism Options: Numeric (10-key pad, lower case keyboard.)	$125/mo	$2600
	1030	Type - Teletype Compatible Transmission speed - 110, 150, 300 bps Parity options Full/Half duplex Character set - Input - ASCII Output - lower case may be printed under computer control Communications Interface - Has a self-contained acoustic coupler (terminal also has a standard interface for another device or modem) Character/line - 80 Weight - 22 lbs Thermal printing mechanism	$135/mo	$3100

HARDCOPY AND KEYBOARD ONLY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
		Options: Lower case keyboard; 10 key numeric pad		
	8330	Type - Teletype Compatible Transmission speed - 110, 150, 300 bps Full/Half Duplex Character set - Full ASCII Communications Interface - Must acquire a separate acoustic coupler or modem or procure the supplier's option of an integral acoustic coupler or modem Character per line - 132 Other features - Up to 5 copies may be printed-full visibility of characters printed (including the last), keyboard generates even parity. Options: Integral modem or acoustic coupler, forms and tabbing controls, numeric keyboard, local storage for tape cassette operations.	$125/mo (1-time installation charge of $50)	$3500
Computer Transceiver	Execuport 300	Type - Teletype Compatible Transmission speeds - 110, 150, 300 bps Parity options - even or odd Full/Half duplex Character set - Full ASCII Communications Interface - Has a built-in acoustic coupler Characters/line - 80 Weight - Portable (29 lbs.) Desk Model (35 lbs.)	Model 311 $135/mo $155/mo Model 320 $135/mo $155/mo (maintenance extra)	Model 311 $3040 $3590 Model 320 $3190 $3890

HARDCOPY AND KEYBOARD ONLY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
		Printing Mechanism - Thermal printer NOTE: 1) This device comes in 2 models 311 or 320 2) Interfaces are available for attachment to other devices Options: Multi-mode (upper case only or upper and lower case keyboard), Model 320 with separate numeric keyboard, interface for connecting to an acoustic coupler or modem may be substituted for a built-in acoustic coupler.		
	Execuport 1200	Type - Teletype Compatible Transmission speed - 110, 150, 300, 600, 1200 bps Parity options - even or odd Full/Half duplex Character set - Full ASCII Communications Interface - Must acquire a separate modem or acoustic coupler Characters per line - 132 maximum Weight - approximately 200 lbs. Printing mechanism - wire matrix impact (quieter than impact only printers) Options: May interface to a display or other peripheral devices, communications controller for transmitting at speeds up to 1200 bps (none required if speed is limited to 300 bps), keyboard with separate numeric pad.	$230	$4995

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Data Interface	DI - 240	Type - This is a receive only device (line printer) which can operate at speeds up to 180 lines per minute or up to 2400 bps Character set - Full ASCII Communications interface - can attach to a separate modem or a display device Characters/line - 80 Weight - 33 lbs. Magnetic line printer Various fonts are available permitting Russian, Hebrew, or Japanese printing Options - Customer specified fonts; 80, 120, or 132 characters per line		$4100
Data Products	PortaCom PC 8110	Type - Teletype Compatible Transmission speed - 110 bps Full/Half duplex Parity options Character set - Full ASCII (lower case are printed as upper) Communications Interface - may have a built-in acoustic coupler or may acquire a separate modem Characters/line - 80 Weight (including case) - 29.5 lbs. Printing mechanism - Impact		$1495

HARDCOPY AND KEYBOARD ONLY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
	209	Type - Teletype Compatible Transmission speeds - 110 and 300 bps Full/half duplex Communications Interface - As an option may have a built-in acoustic coupler or user can acquire a separate coupler or modem Character set - ASCII Weight - 10 lbs. This model is identical to the 33 except for the fact the display driver displays 16 lines of 40 characters each and the fact it can be used with a standard television set or a video monitor NOTE: The supplier also provides a CRT Terminal which can be customized for a customer's needs.		$1195
DI/AN Controls, Inc.	9030 R-132	Type - Teletype Compatible Transmission speed - 110, 150, 300 bps Full/half duplex Parity options - switchable, odd , even or none Communications Interface - user must acquire a separate acoustic coupler or modem Character set - Full ASCII with shift key for upper case only Characters per line - 132 Print Mechanism - Wire matrix impact (up to 5 copies may be produced)		$3330

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Data Terminals and Communications	ROC3	Type - Receive only printer Transmission speed - 110,150,300 bps Communication Interface - must acquire a separate modem or could attach to another device having a RS-232-C connection Character/line - 132 Printing mechanism - Impact Character set - Full ASCII with a variety of different fonts. Weight - 46 lbs.		$2100
DIGILOG	33	Type - Teletype compatible - Keyboard only Transmission speeds - 110 and 300 bps Full/half duplex Communications Interface - As an option may have a built-in acoustic coupler or user can acquire a separate coupler or modem Character set - ASCII Weight - 10 lbs This model contains an alphanumeric display driver, 16 lines of 80 characters each which allows it to be attached to a video monitor (9" - $150; 12" - $250). It has controls for page or scroll (roll) and edit modes. Options: Built-in coupler ($100 extra) Speeds up to 9600 bps Batch mode Hard-copy and magnetic tape Cassette interfaces		$1,295

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
General Electric	Terminet 1200	Type - Teletype Compatible Transmission speed - 110, 300, 1200 bps Full/half duplex Character set - Full ASCII with switch for upper only Communications Interface - User may acquire an internal modem or may acquire a separate modem or acoustic coupler Character/line - 80 Weight - 90 lbs. Printing mechanism - Chain-type impact printer (relatively quiet) - up to 6 carbon copies can be made. Options - Internal modem; 300, 600, 1200 bps or 110, 200, 1200 bps speed options; 120 characters per line; tape reader interface; receive only version for attaching to another device such as a CRT. NOTE: General Electric also produces the Terminet 300 printer with transmission speeds limited to 300 bps. $3625	$165	$4240

HARDCOPY AND KEYBOARD ONLY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
The International Business Machines (IBM)	Communicating Magnetic Card Typewriter	Type - IBM 2741 Compatible Transmission speed - 134.5 bps (15 cps) Characters per line - 132 characters Communications Interface - Separate full-duplex modem must be acquired. Half duplex Character set - Correspondence code Printing mechanism - Impact This device provides the ability to either transmit to or receive from the Magnetic Card or Keyboard. Approximately 5000 characters may be stored on a Magnetic Card. Standard features include the Dial Interface, Receive and Transmit interrupts	$250	
IBM	2741	Transmission speed - 134.5 bps (15 cps) Half duplex Characters per line - 132 Communications Interface - May have a built-in modem if terminal is less than 4.75 miles from computer site. Otherwise, separate full-duplex modem or coupler must be acquired Character set - Correspondence or EBCDIC Printing mechanism - Impact Options include: Receive and transmit interrupts, and pin feed platen (purchase only)	$108.50	$4460

HARDCOPY AND KEYBOARD ONLY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Memorex	1240	Type - Teletype Compatible Transmission Speed 110, 150, 300 bps Full/half duplex Character set - Full ASCII Characters per line - 132+ Communications Interface - User must acquire a separate acoustic coupler or modem Weight - 160 lbs Options: Tape Cassette Unit (Model 1280)	$145/mo	$4200
National Cash Register	NCR 260-2	Type - Teletype Compatible Transmission Speed - 110 or 300 bps Full/half duplex Optional parity settings - even, odd, or none Character set - Full ASCII Characters/line - 80 Communications Interface - User must acquire a separate modem or acoustic coupler. (NCR will supply coupler) Weight - 25 - 40 lbs Printing mechanisms - Thermal Options - Answer back memory (provides automatic terminal identification without operator identification), paper extender kit for use with larger rolls of paper, and top of form. Note: 1) Variations of Model 260 are a receive only terminal 260-1 which consists of two separate modules (printer and power supply), Model 260-5 which operates the same as 260-2 but has an integrated 300 bps modem with an acoustic	$80	$2320

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
		coupler, and Model 260-6 (ASR) with a separate numeric keypad, an integrated magnetic tape cassette and an optional integrated modem. 2) NCR is now marketing a new display (796 series) for attachment to its 260-1 terminal or other receive only (RO) devices. Type - Teletype Compatible Transmission speed - 110, 300, 1200 2400, and 9600 bps Full/half duplex Character Set - ASCII Variable parity settings (advertised as low cost)	(260-1) $70 (260-5) $122 (260-6) $130	(260-1) $1960 (260-5) $2795 (260-6) $4395
Printer Technology, Incorporated	PRINTEC -100	Type - Receive only printer Speed - 100 characters per second or 35 (132 col.) and 55 lines per minute (71 col.) Character set - ASCII Communications Interface - Can be attached to a display device or can be attached to separately acquired modem. Weight - 111 pounds Printing mechanism - serial impact (up to 6-part printout) Options - Communications Interface, fonts other than Gothic, form feed control.		$2750

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Teletype Corporation	33/35 KSR	Transmission Speed - 110 bps Characters/line - 72 Character set - ASCII All units come with paper tape units Communications Interface - Built-in acoustic coupler or modem (The 35 is a more rugged device)	*	(33) - $700 (35) - $1900
	37 KSR	Transmission Speed - 150 bps Characters/line - 72 - 132 Character set - Full ASCII Parity - even	*	$2700
	38 KSR	Transmission Speed - 110 bps Characters/line - 132 Character set - Full ASCII	*	$1200
		* These devices may be leased from your local telephone company or Western Union Data Services (approximately $52 to $115/mo)		
Texas Instruments, Incorporated	725	Type - Teletype Compatible Transmission Speed - 110, 150, 300 bps Communications Interface - Built-in Acoustic Coupler Characters/line - 80 Weight - 35 lbs Character set - ASCII Thermal Printing Mechanism Option: RS232-C Interface connector, upper-lower case ($120), and answer back memory.	$145	$2495

HARDCOPY AND KEYBOARD ONLY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
	733 ASR or 733 KSR	Type - Teletype Compatible with or without magnetic tape cassette unit Transmission Speed - 110, 150, 300 bps Character set - ASCII Communications Interface - must acquire a separate coupler or modem Characters/line - 80 Weight - KSR Unit, 38 lbs. ASR Unit, 55 lbs. Variable parity settings - even, odd, or none Thermal Printing Mechanism Options: RS232C Interface Connector, built in modem, upper-lower case ($100), 1200 bps transmission for use with 733 ASR single or twin magnetic tape cassettes, automatic search control (733 ASR)	$140 $ 95	(733 ASR) - $2750 (733 KSR) - $1500
Texas Instruments, Incorporated	735	Type - Teletype Compatible Transmission Speed - 110, 150, 300 bps Character set - Full ASCII Communications Interface - Built-in Acoustic Coupler Characters/line - 80 Weight - 25 lbs Character set - Full ASCII Thermal Printing Mechanism Options: RS-232C interface connectors Note: Texas Instruments also produces a number of Receive Only (RO) printers ranging in price from $1200 - $1800	$140	$2595

HARDCOPY AND KEYBOARD ONLY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Sperry-Rand Univac Division	DCT 500 ASR/KSR	Type - Teletype Compatible or Receive Only Printer Transmission Speed - 110, 150, 300 bps Communications Interface - Must acquire a separate acoustic coupler or modem Characters/line - adjustable up to 132 Half/Full duplex Character set - generates full ASCII Options: Paper tape subsystem, automatic answering, auxilliary table	$80 $10	(ASR) $3325 (KSR) $385
Tally Corporation	2000	Type - Receive Only Printer Transmission Speed - 125 to 200 lines per minute Characters/line - 132 Communication Interface - Can be attached to another device /or to a modem (data set) via RS-232 interface connector Character set - ASCII Weight - 150 lbs Printing mechanism - cross point that generates dot-matrix characters Options - Full ASCII, Printer Stand.	$275-$350	$4570-$5015

HARDCOPY AND KEYBOARD ONLY DEVICES

MANUFACTURER	MODEL	DESCRIPTION	COST	
			LEASE	PURCHASE
Tycom Systems Corporation	TYCOM 38	Type - Teletype Compatible Transmission Speed - 110 bps Communications Interface - Unit has an integral acoustic coupler This device offers a unique technique for converting a selectric typewriter into a terminal (typewriter can be used on-line or off-line). Characters/line - 130 Character set - 88 of the full ASCII character set. Options: 150 bps, attachment to another TYCOM Unit (35/37)		$2350
Western Union Data Services Company	EDT 300/ 1200	Type - Teletype Compatible Transmission Speed - EDT 300 = 110, 150 300 bps; EDT 1200 = 110, 300, 1200 bps Full/Half duplex Communications Interface - must acquire a separate acoustic coupler or modem. RS232 interface standard Character set - Full ASCII Characters/line - 120 Parity Options Weight - 90 lbs Printing mechanism - chain type impact print (relatively quiet). These models are modifications of the General Electric Terminets. * Separate installation charge.	*$110 (300) *$171 (1200)	